# ANP 1106: Topic 3B

# Anatomy of the Skeletal System

**Throughout this section, refer to table 6.1: Bone Markings – *you are responsible for being able to define all of these bone markings***

# THE SKELETON (Chapter 7)

- **206** bones in human skeleton - make up about 20% of body weight
- grouped into **axial** and **appendicular** skeletons

  **axial skeleton** = bones of skull, vertebral column, rib cage

  **appendicular skeleton** = bones of upper & lower limbs + pectoral/pelvic girdles (attach limbs to axial skeleton)

## AXIAL SKELETON
## 80 bones

**SKULL**

most complex

2 sets of bones: **cranial** + **facial** = 22 bones

most skull bones are flat bones; (except mandible);united by **sutures**

facial bones form anterior part of skull & cranial bones form the rest

skull has eye orbits & paranasal sinuses, houses organs of hearing, has 85 openings for nerves, blood vessels & spinal cord

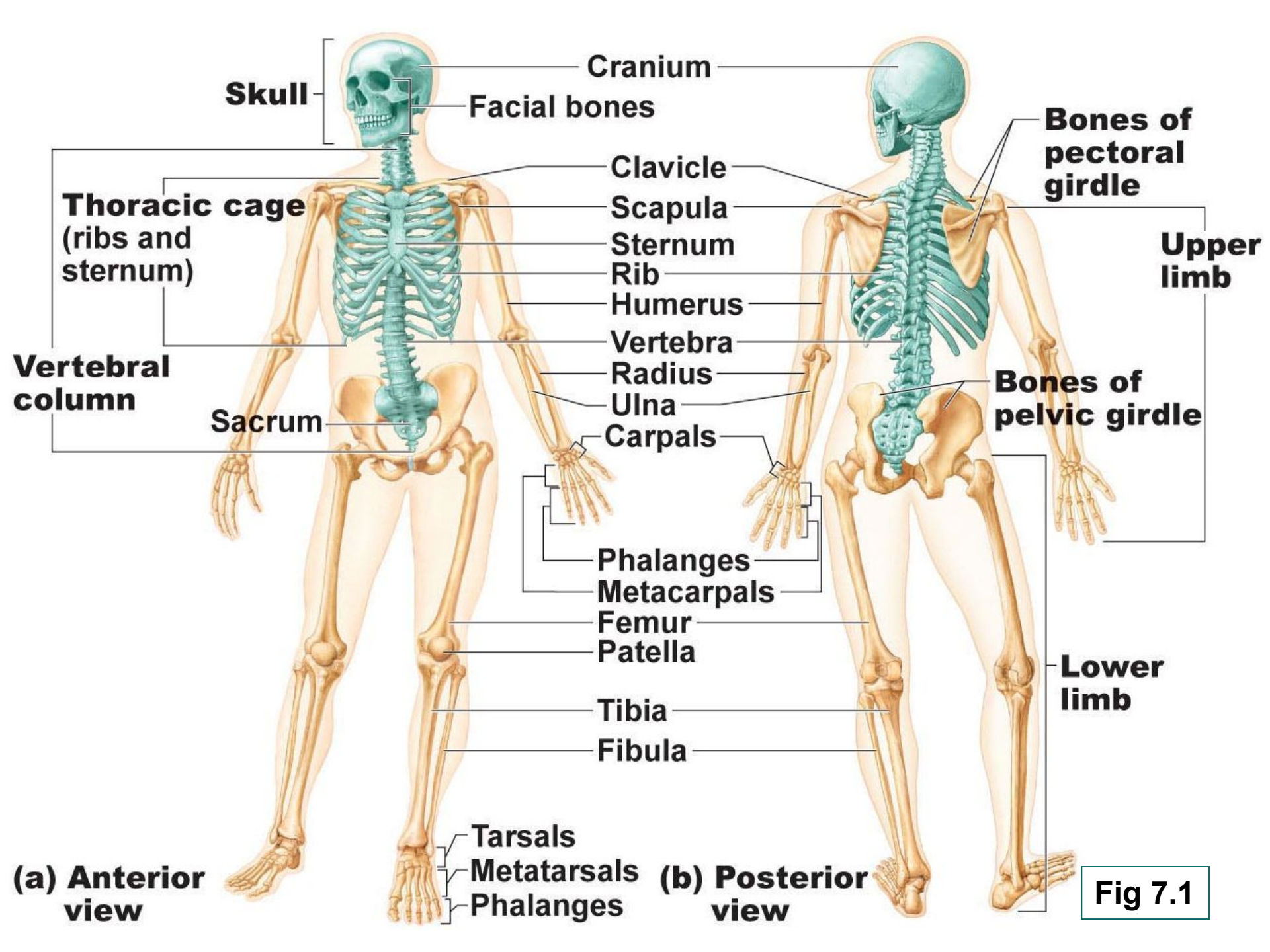
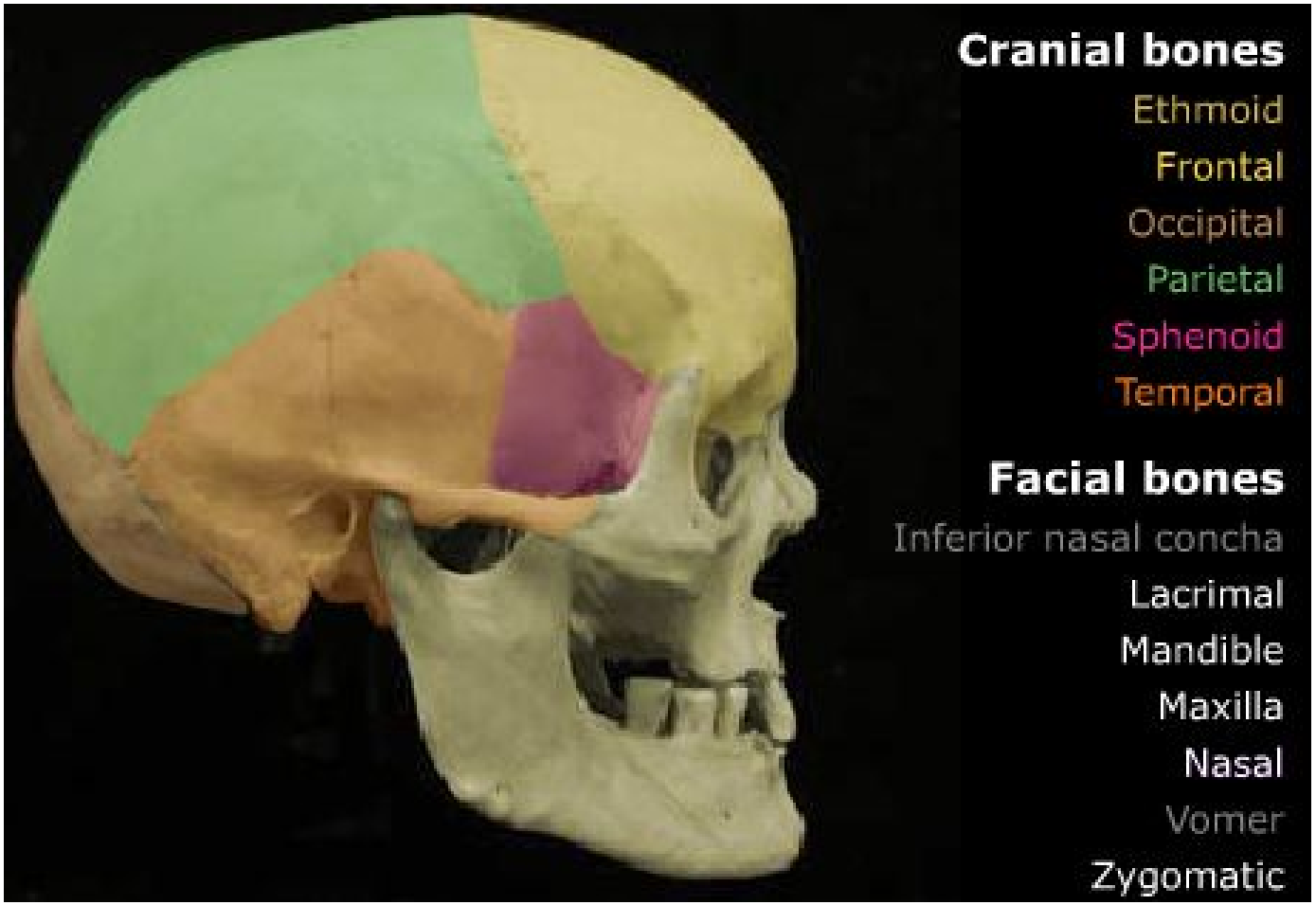

Skull
Cranium
Facial bones
Clavicle
Thoracic cage
(ribs and
sternum)
Scapula
Sternum
Rib
Humerus
Vertebra
Vertebral
column
Radius
Ulna
Sacrum
Carpals
Phalanges
Metacarpals
Femur
Patella
Tibia
Fibula
Tarsals
Metatarsals
Phalanges
(a) Anterior
view
(b) Posterior
view
Bones of
pectoral
girdle
Upper
limb
Bones of
pelvic girdle
Lower
limb

Fig 7.1

## A) Cranium:

- cranium can be divided into a **vault** & a **base**
- **vault**: forms superior, lateral & posterior aspects of the skull + forehead
- **base**: inferior aspect of skull
- cranium surrounds & protects brain & organs of hearing & balance
- internally, 3 bony ridges divide the cranial base into 3 distinct areas: ante (highest) fossa, middle fossa & posterior (lowest) fossa




Projections That Ar
Tuberosity (too"bĕ-ros'i-te)
Crest
Trochanter (tro-kan'ter)
Line
Tubercle (too'ber-kl)
Epicondyle (ep"i-kon'dil)
Spine
Process

Projections That He
Head
Facet
Condyle (kon'dīl)
Ramus (ra'mus)

Depressions and O
For Passage of Bloo
Groove
Fissure
Foramen (fo-ra'men)
Notch
Others
Meatus (me-a'tus)
Sinus
Fossa (fos'ah)

## B) Facial bones:

form framework of the face

contain the cavities for the sensory organs of sight, smell & taste

provide openings for passage of air & food

secure the teeth

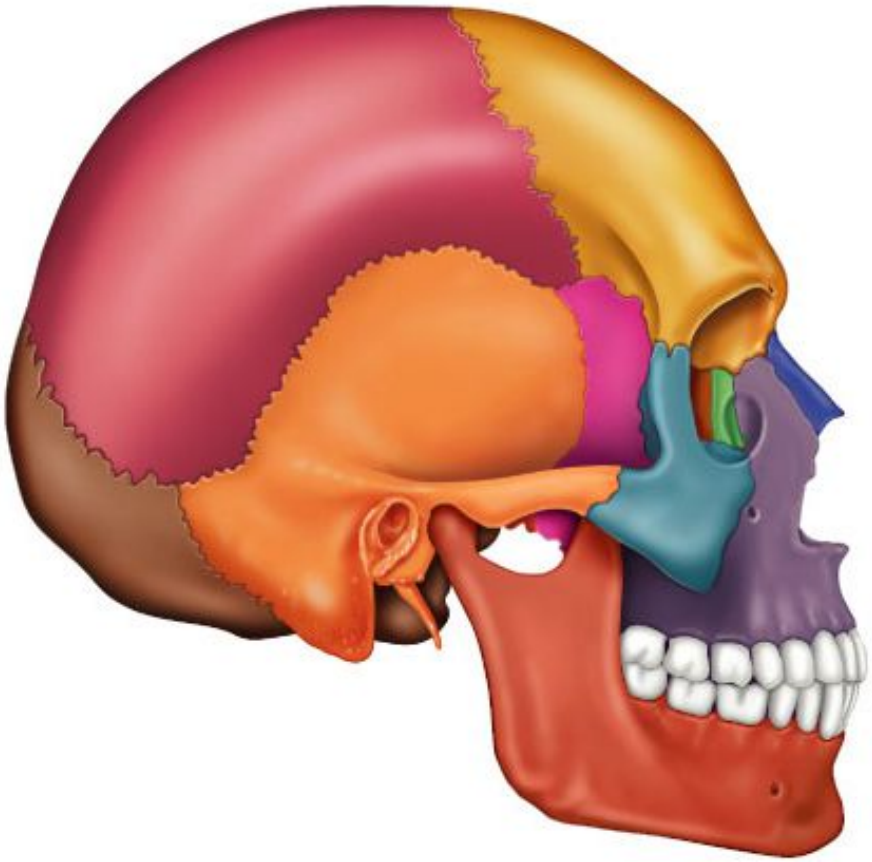
anchor the facial muscles that we use to show our feelings

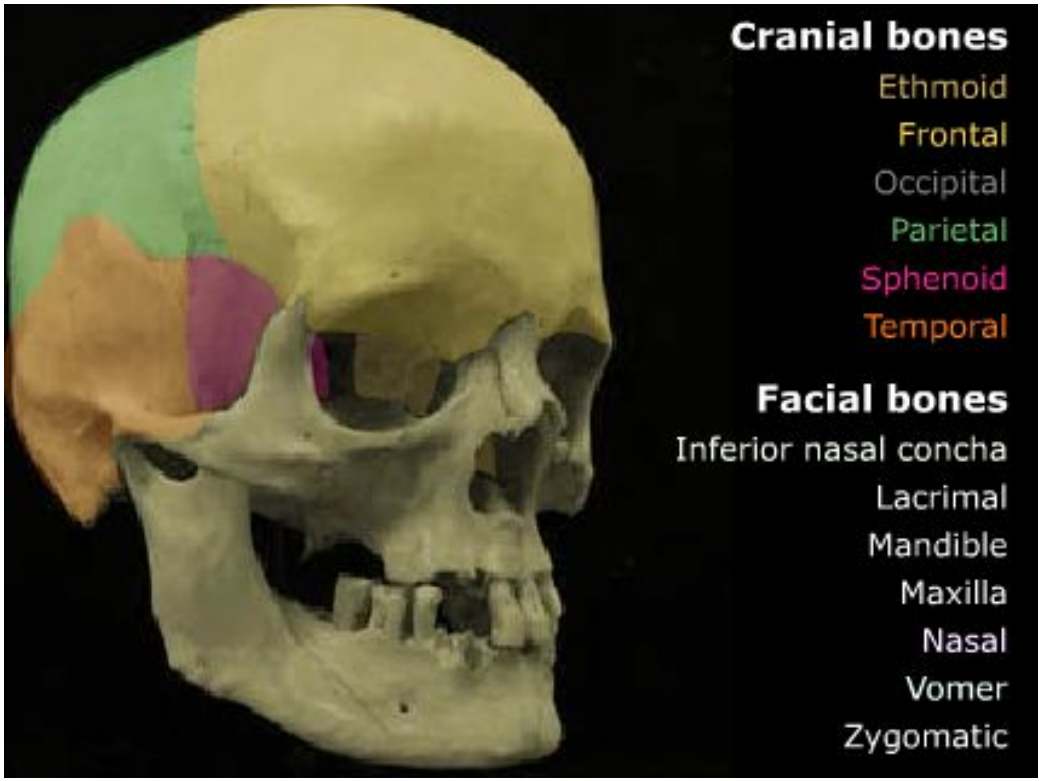
Fig. 7.4a

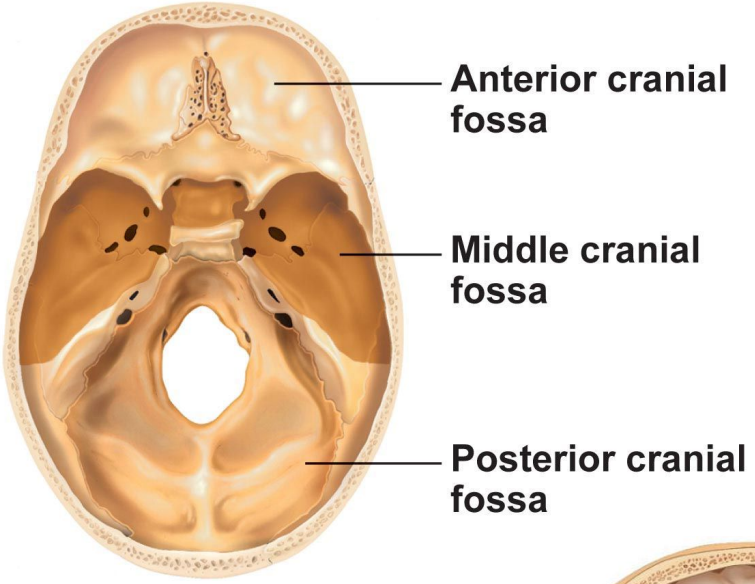
**Cranium**: 8 cranial bones are the **paired** **parietal** & **temporal** bones & the **unpaired** **frontal**, **occipital**, **sphenoid** & **ethmoid** bones

curvature allows them to be self-bracing; can be strong while being quite thin

Fig. 7.5a







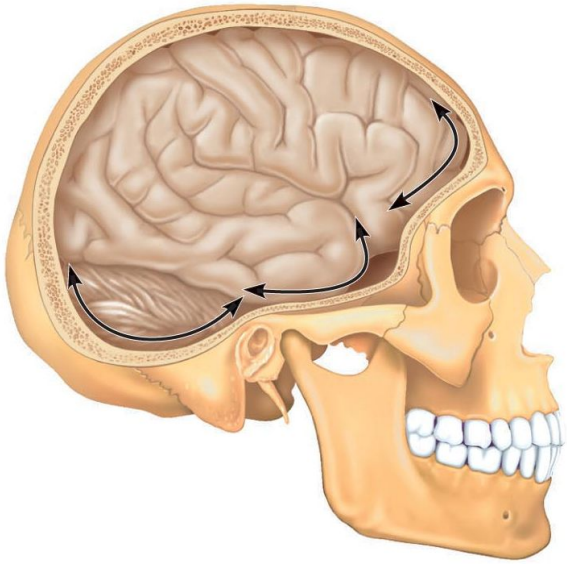



Fig. 7.2C

Fig. 7.4a

***(i) Frontal Bone:***

dome-shaped bone; also forms the roof of the orbits & anterior cranial fossa

articulates with paired parietal bones posteriorly

note supraorbital margin, supraorbital foramen, and glabella

area lateral to glabella has left & right frontal sinus within bone

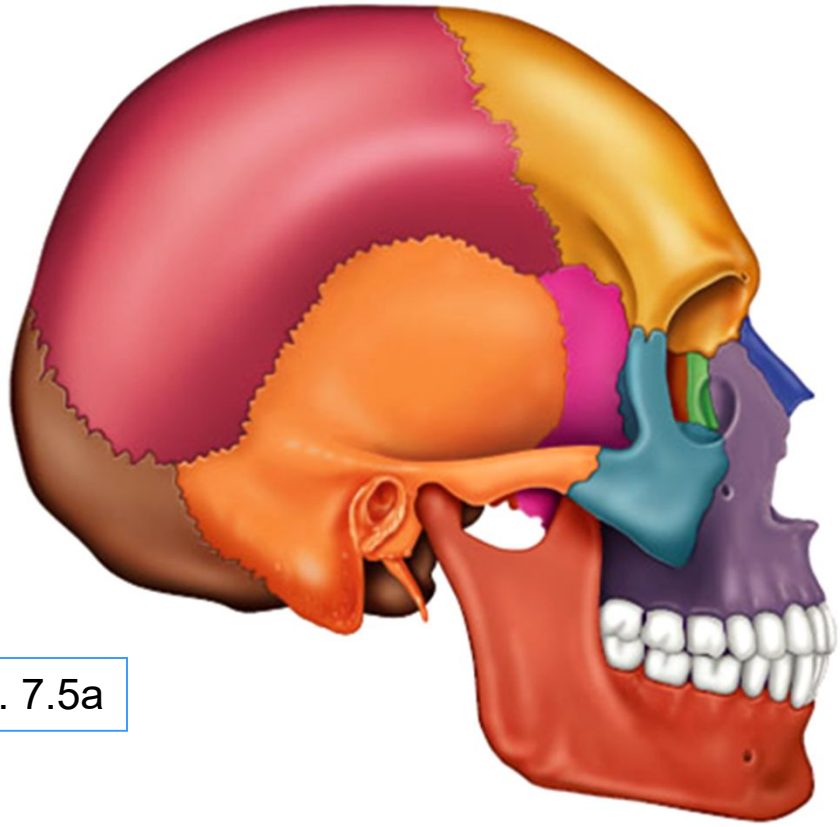


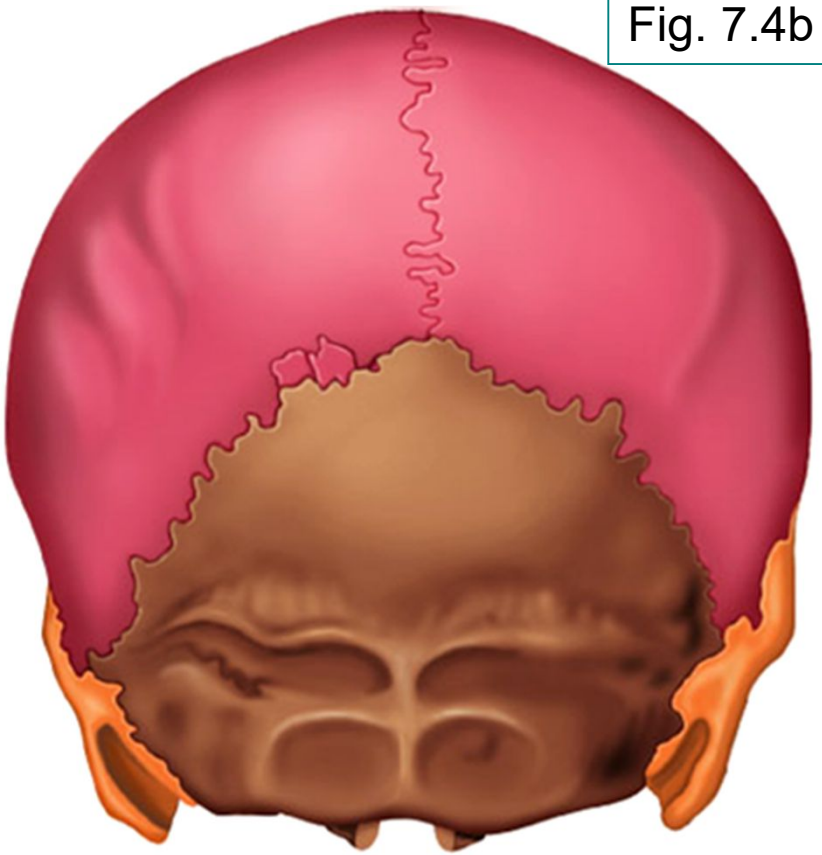
Fig. 7.5a

## *(ii) Parietal Bones*

paired - form superior & lateral aspects of skull

therefore form bulk of **cranial vault**

Fig. 7.4b



## *(iii) Occipital Bone:*

single bone at base of skull; helps form post aspect of skull

also forms walls of the posterior cranial fossa

attaches anteriorly to the 2 parietals & 2 temporals on either side & attaches to sphenoid

Fig. 7.6a

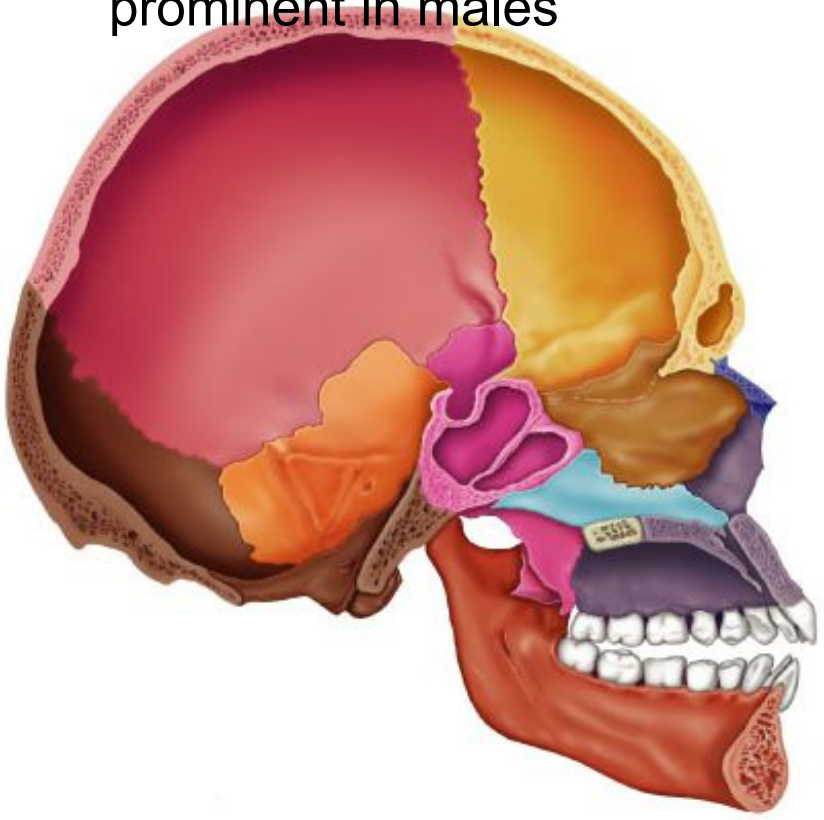
## *(iii) Occipital Bone (cont.)*

large hole at base = **foramen magnum** (passage for ……..……)

**occipital condyles** on each side of foramen magnum = site of articulation with atlas (C1); where head sits on top of the vertebral column

**external occipital protuberance** = projection at back of skull - more prominent in males

Link to slide 21



## *(iv) Temporal Bones*

paired; form inferior & lateral aspects of skull and parts of the cranial floor

located just below the 2 parietal bones; have 3 very different areas or regions

Fig. 7.5b

1) **Squamous region:** flattened

zygomatic process to cheekbone **(zygomatic bone)**

mandibular fossa receives condyle of mandible

2) **Tympanic region:** surrounds external acoustic/auditory meatus

3) **Petrous region** is on internal aspect of temporal bone

contributes to cranial base; houses middle and inner ear cavities

**mastoid process** is attachment site for some neck muscles

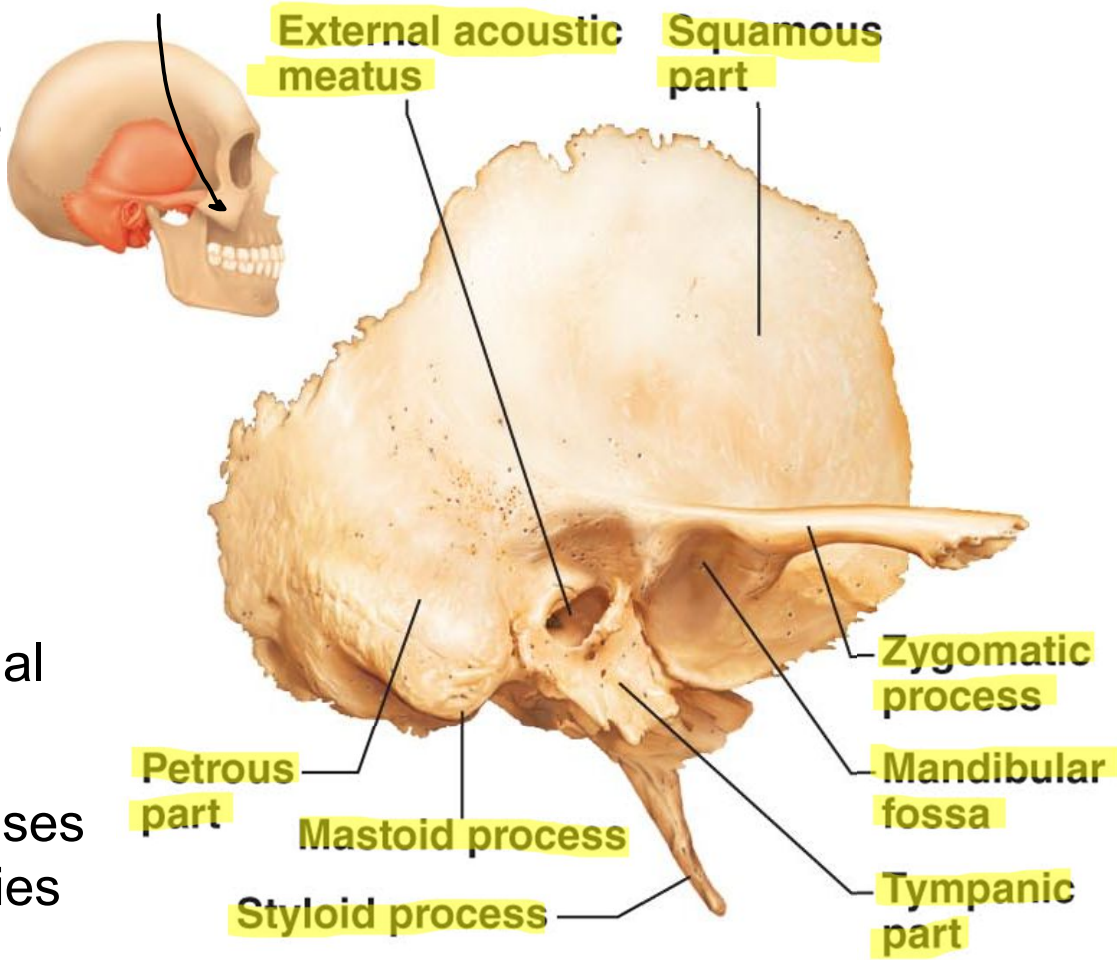



Fig. 7.8: Temporal Bone

**styloid process** is attachment area for muscles of the tongue

several important foramina associated with this part of the temporal bone: jugular foramen, carotid canal, internal acoustic meatus

## *(v) Sphenoid Bone:*

complex bone; difficult to visualize; articulates with all other cranial bones

forms base of middle cranial fossa; contributes to base of anterior cranial fossa

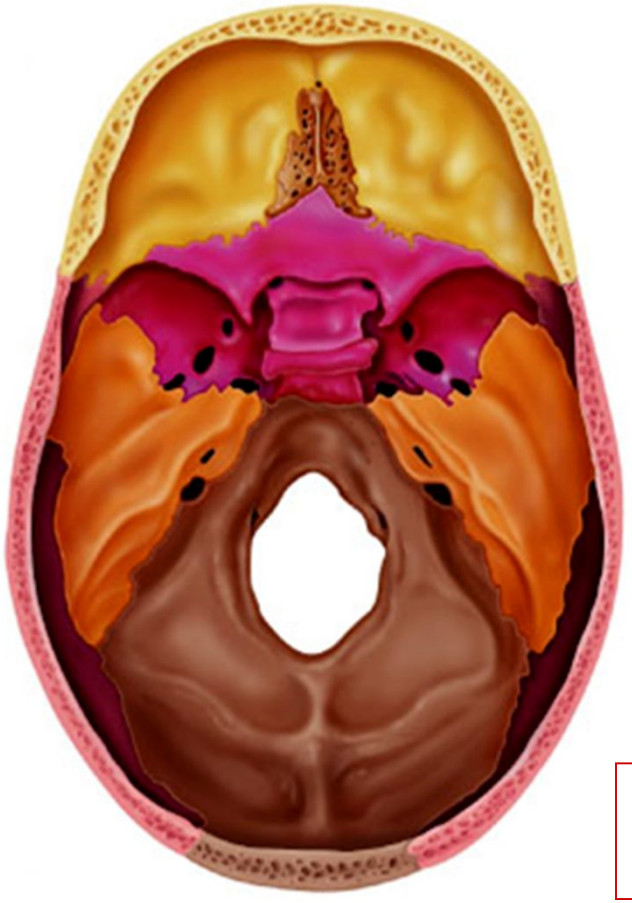


**Fig 7.7a: Superior view of floor of cranial cavity**

central body which contains sphenoid sinuses

**3 projections:**

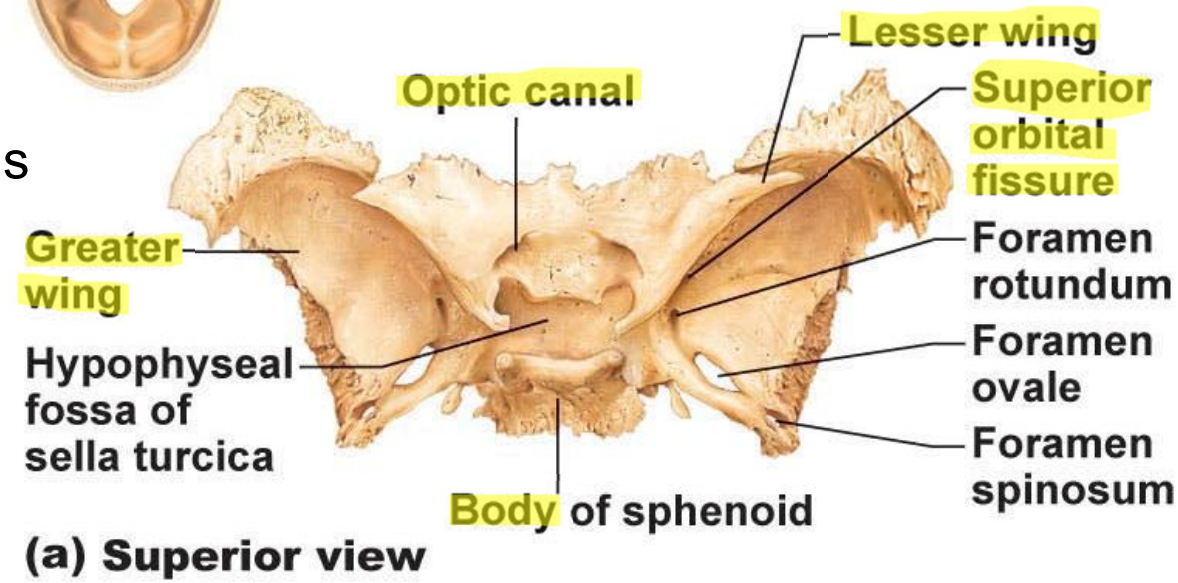
**greater & lesser wings** (orbits, MCF & ACF)

**pterygoid processes** (muscles for chewing)

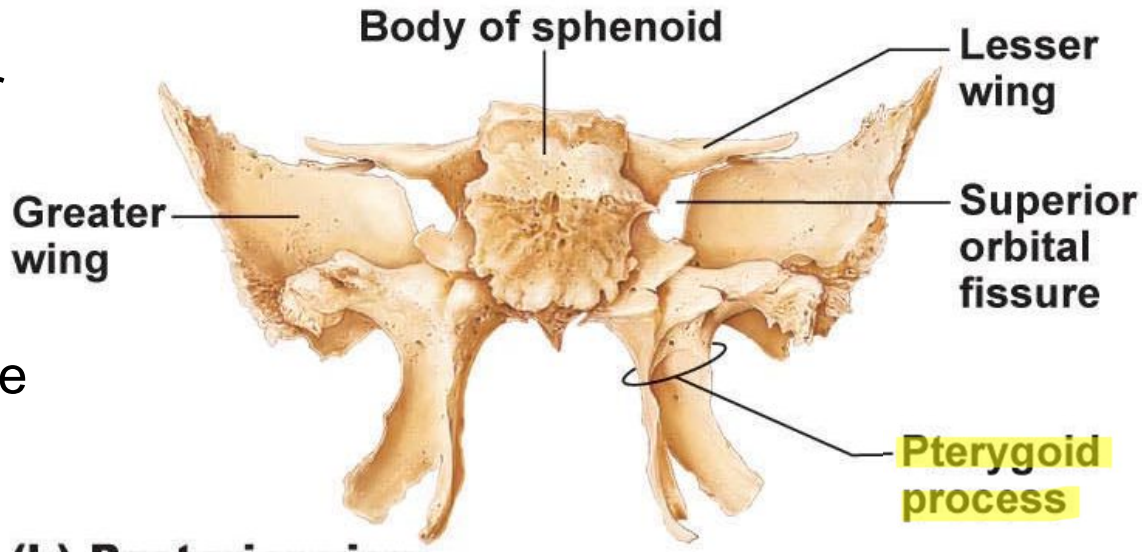
optic foramina (canals): for optic nerves

superior orbital fissure between greater & lesser wings (cranial nerves for eye movement)

Fig. 7.9

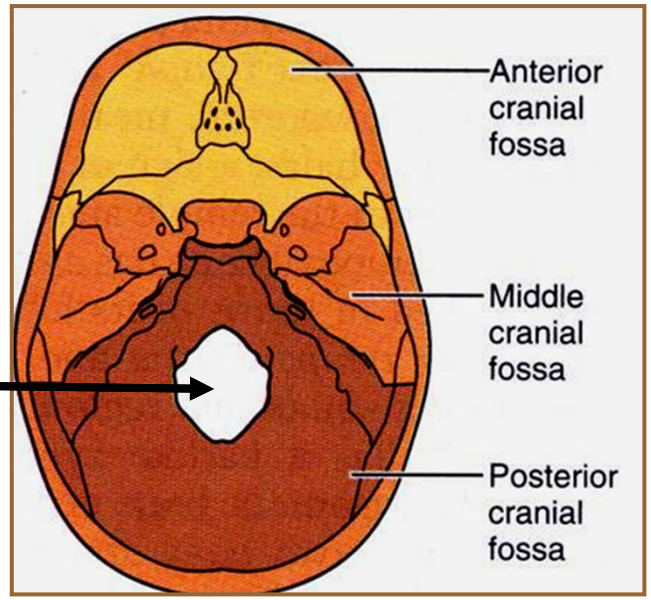


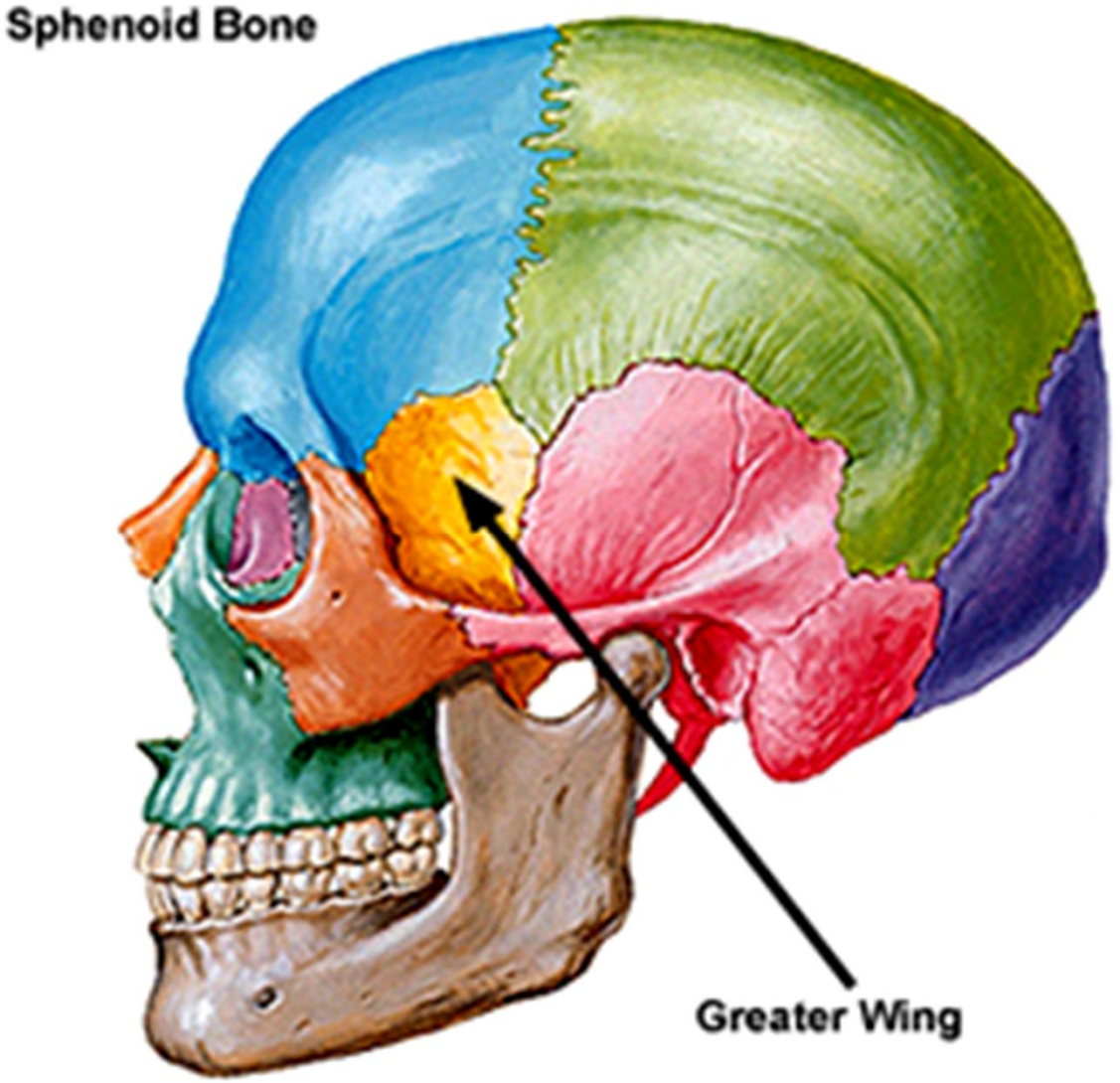

(a) Superior view




(b) Posterior view

Cranial cavity floor showing major fossae

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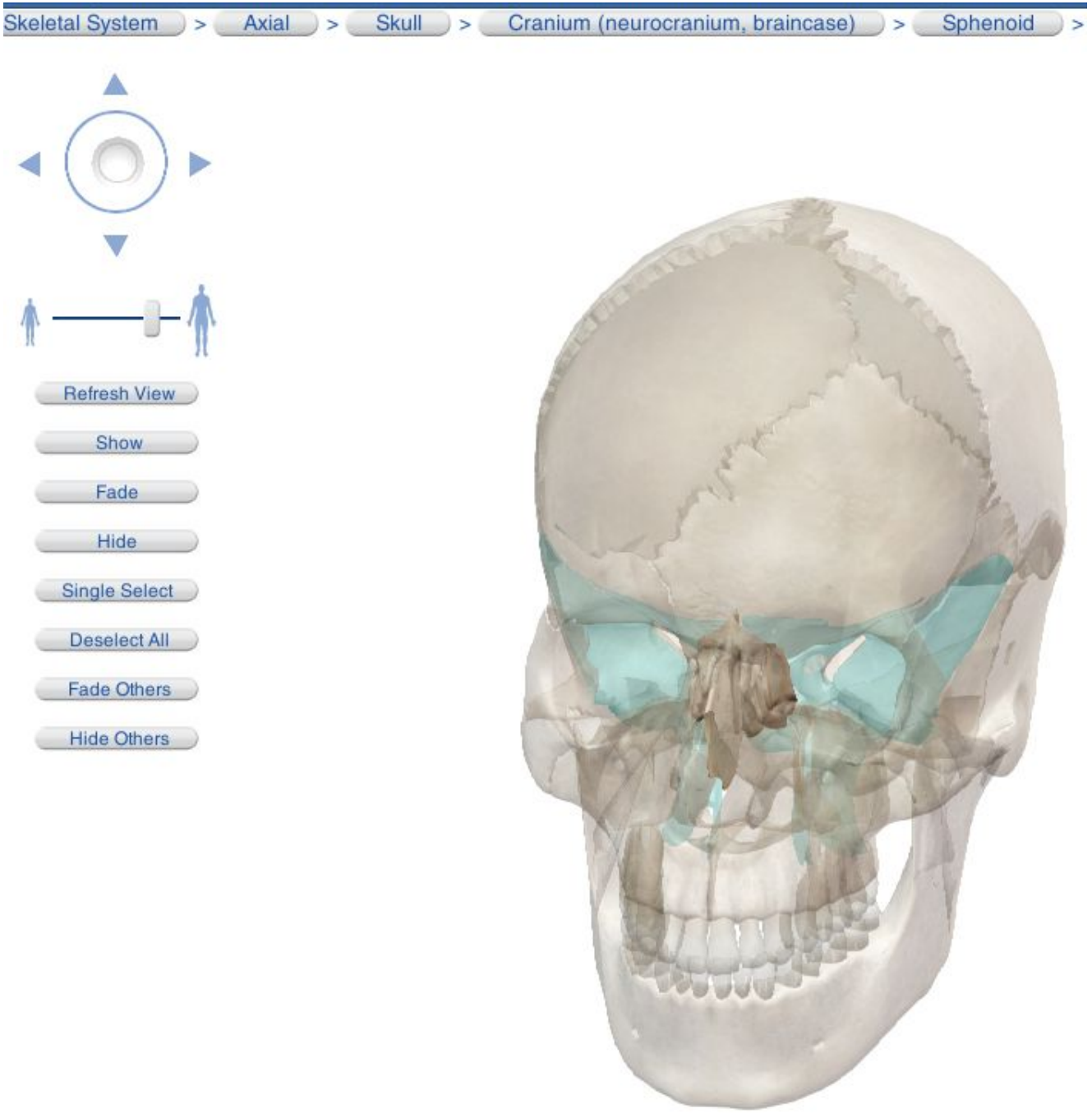
**From Visible Body:**



***(vi) Ethmoid bone:*** approximates a cube that lies deep between orbits & nasal cavities (deepest bone in the skull)

**cribriform plate** forms roof of nasal cavity & floor of anterior cranial fossa; tiny holes (olfactory foramina) transmit olfactory nerves

**perpendicular plate** projects inferiorly to contribute to nasal septum

**crista galli** projects superiorly to attach to dura mater of brain

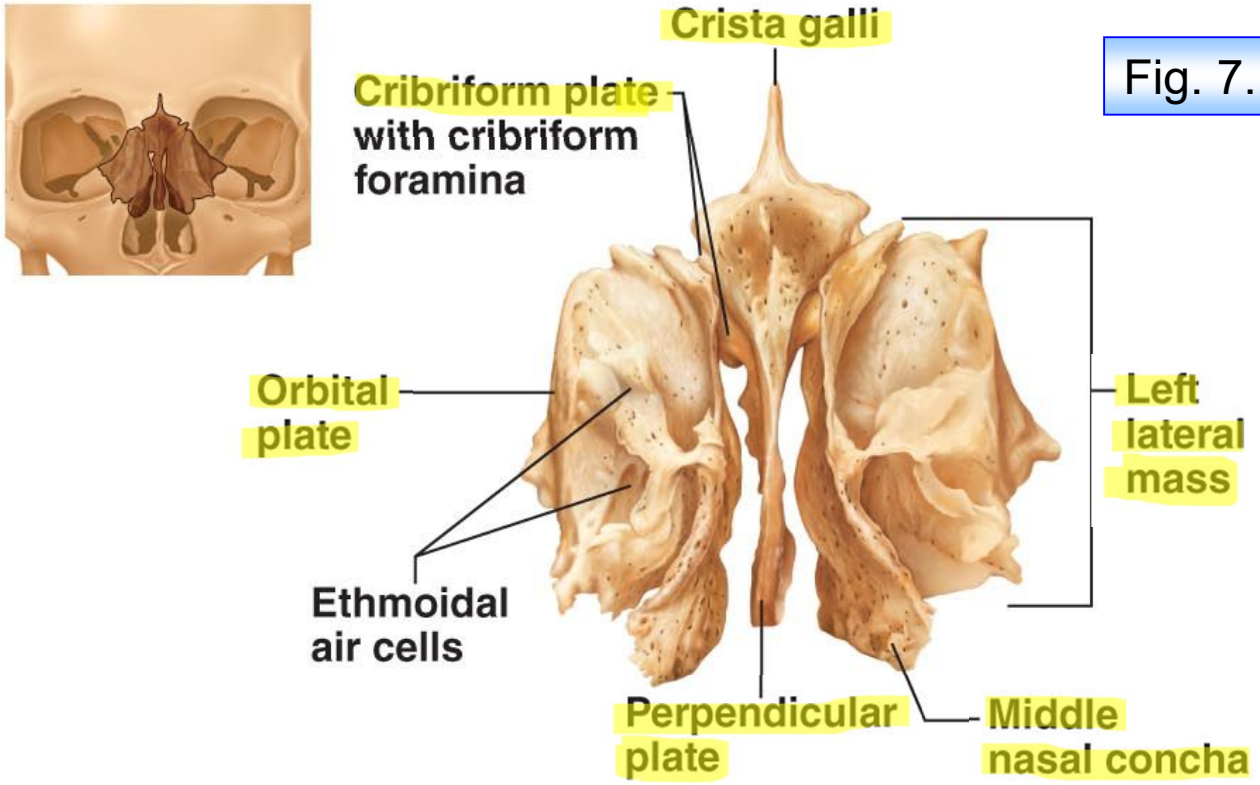
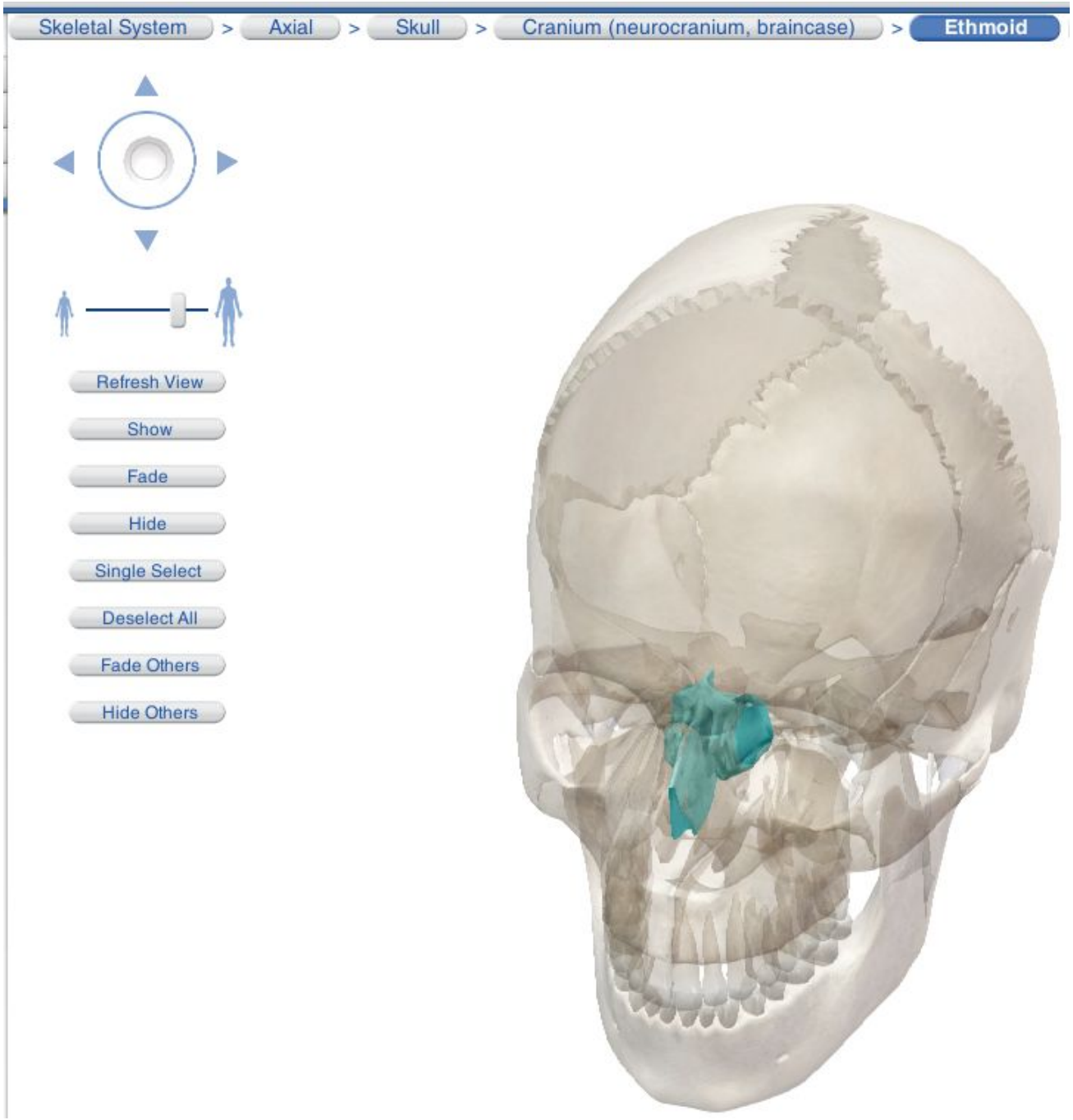



Fig. 7.10

lateral masses contain ethmoid sinuses
medially are superior & middle nasal conchae
laterally are orbital plates - contribute to medial walls of orbits

**From Visible Body:**



## ***Major Cranial Sutures:***

- bones of the adult skull are firmly united by **sutures**
- 4 main sutures that connect the cranial bones

**(1) Coronal suture:** frontal bone & 2 parietal bones
**(2) Squamous suture:** parietal bone & temporal bone
**(3) Lambdoid suture:** occipital bone & 2 parietal bones

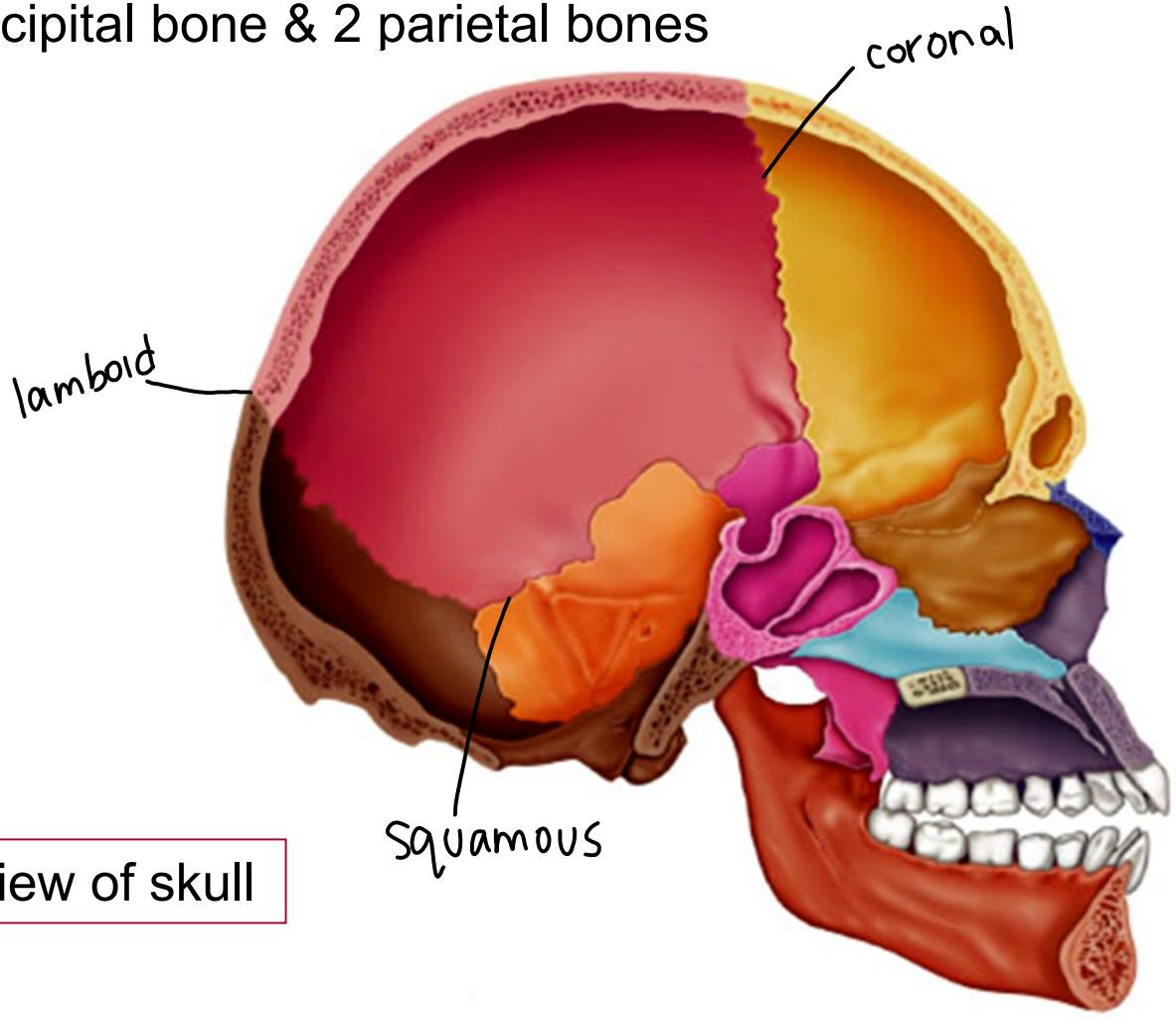
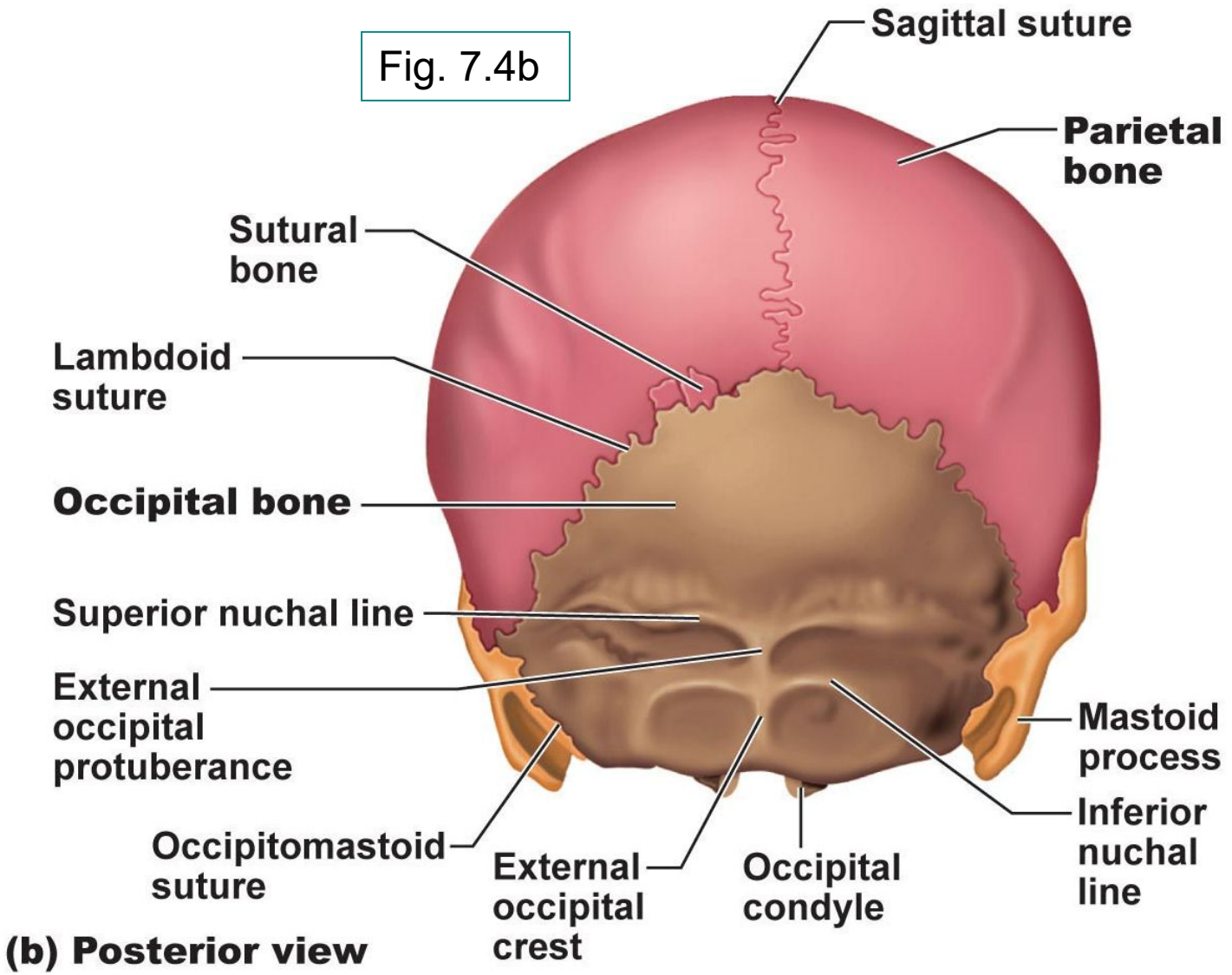


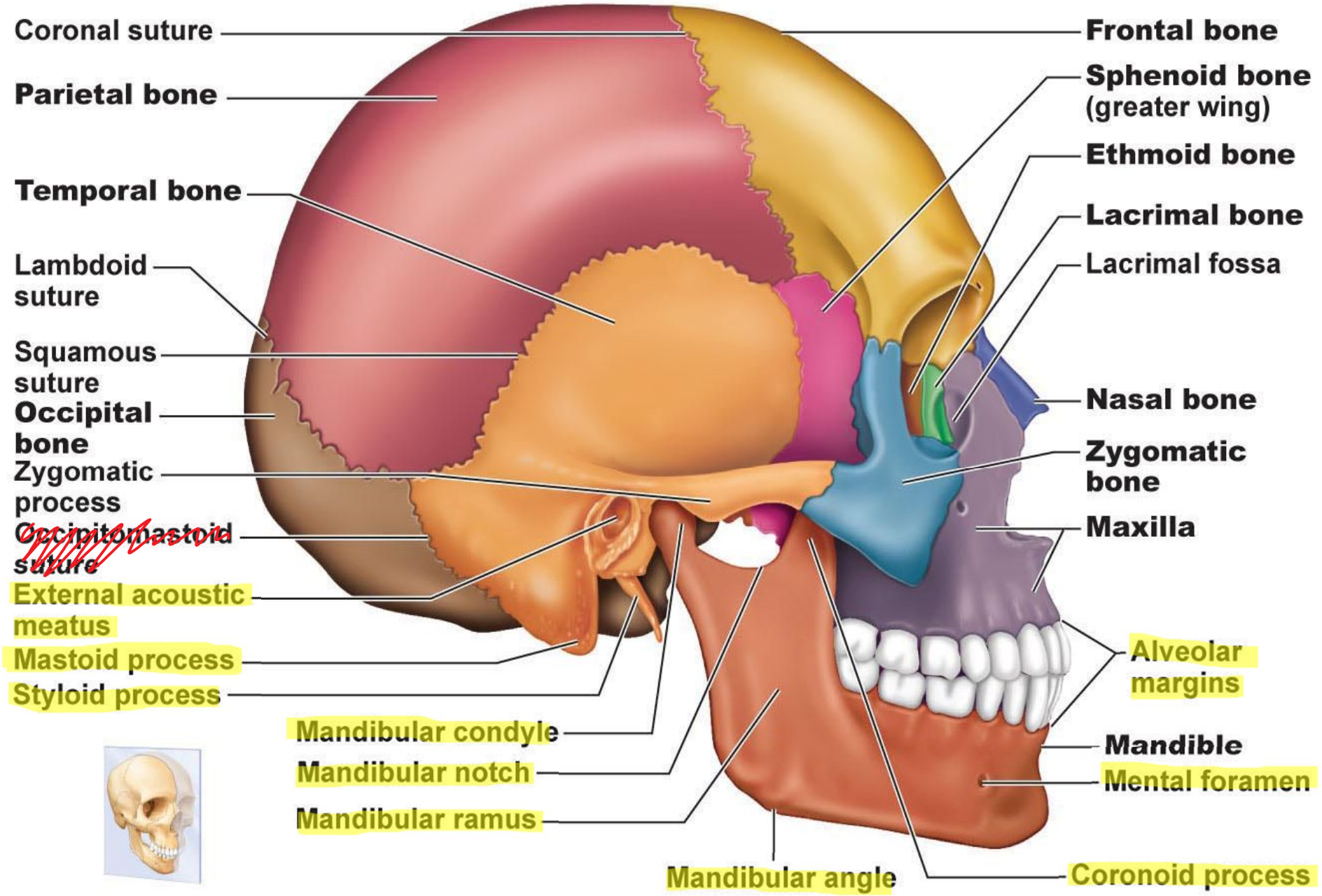

Fig. 7.5c: Midsagittal view of skull

**(4) Sagittal suture:** 2 parietal bones

**Sutural bones:** tiny irregular bones; can occur within cranial suture
additional ossification centres that appeared rapidly during fetal development

Fig. 7.4b






(a) External anatomy of the right side of the skull

**Facial Bones**: 14 bones of which **mandible** & **vomer** are **unpaired**

**paired** bones are: **maxillae, zygomatic, nasal, lacrimal, palatine & inferior conchae**

***(i) Mandible:*** lower jaw bone - strongest & largest bone of the face

- body is horizontal part & contains chin; left & right rami join body at mandibular angle

**note:** mandibular notch, coronoid process (insertion of temporalis muscle), mandibular condyle, alveolar margin (contains tooth sockets), mandibular foramina (nerves to teeth in lower jaw) & mental foramina (blood vessels & nerves to chin & lower lip)

**Fig. 7.11a**

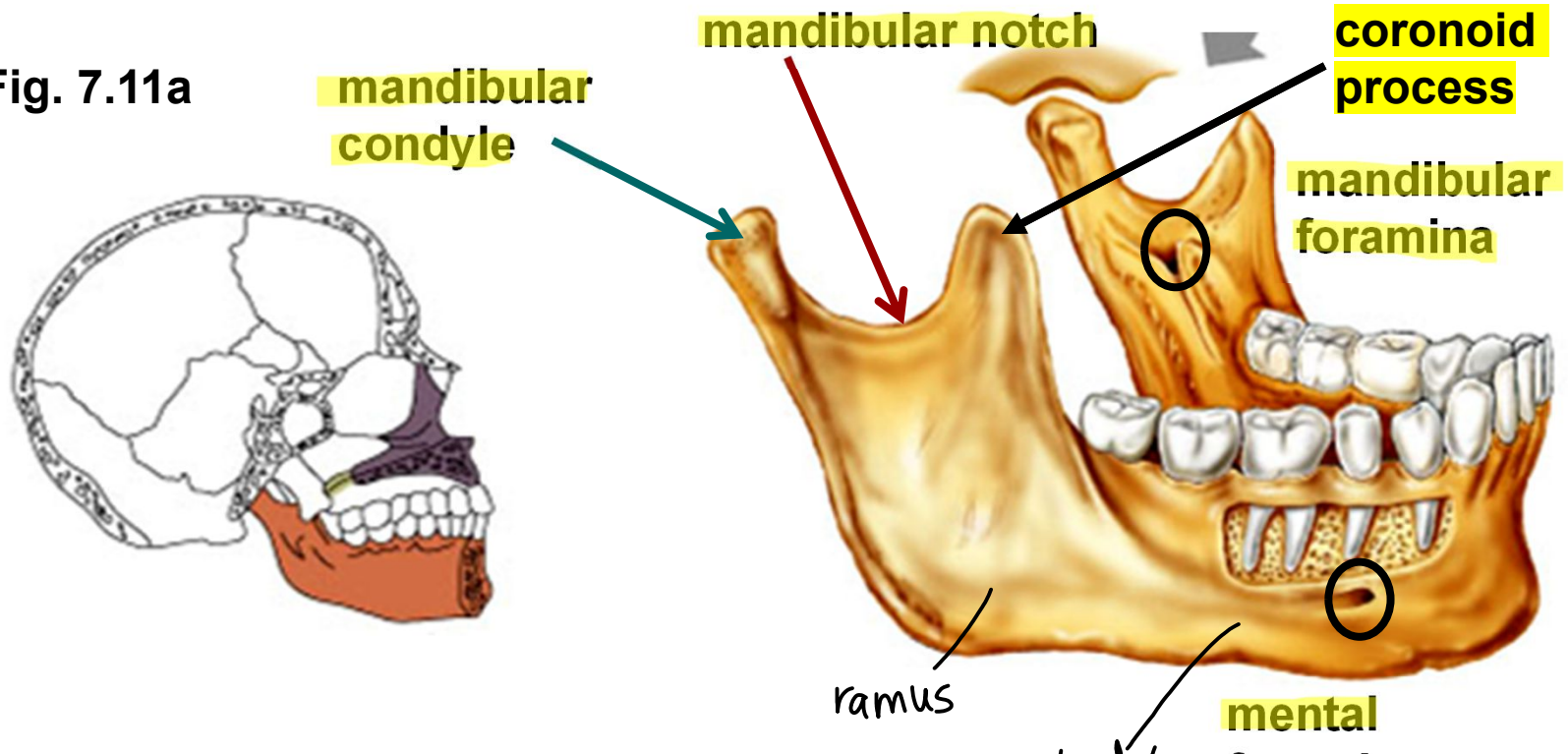
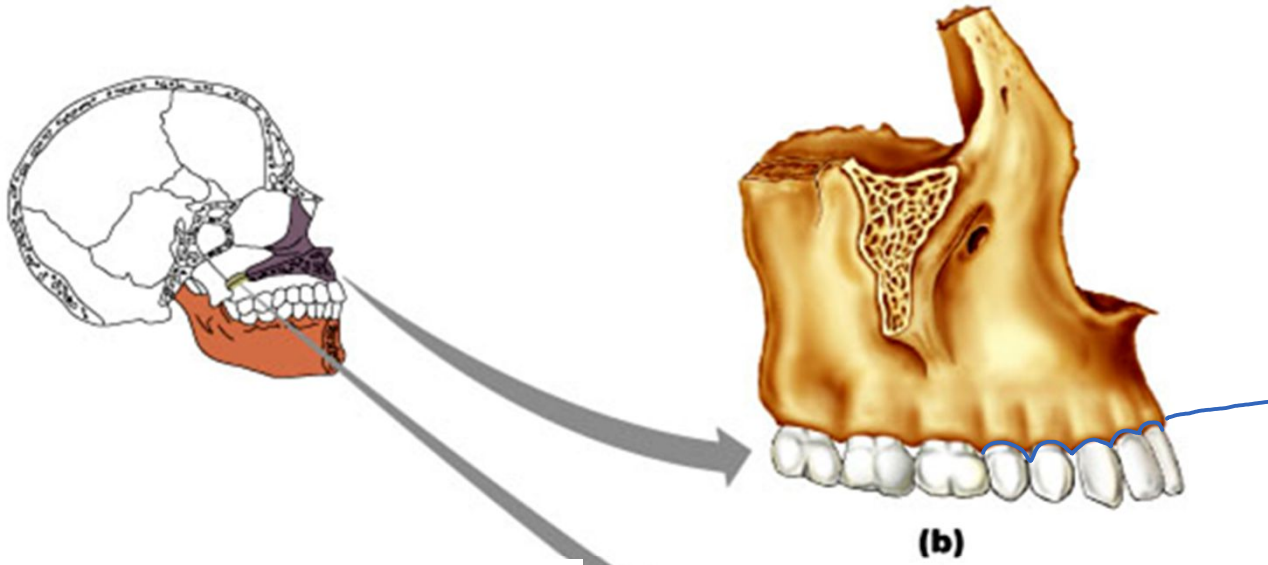


Fig. 7.8

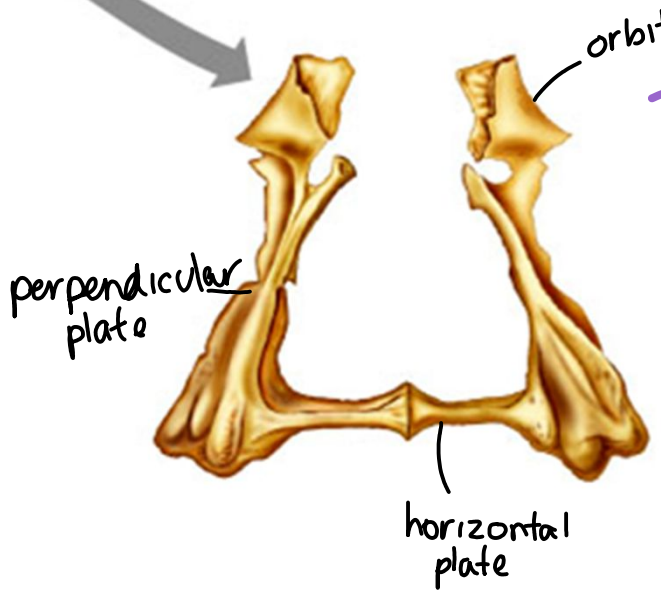


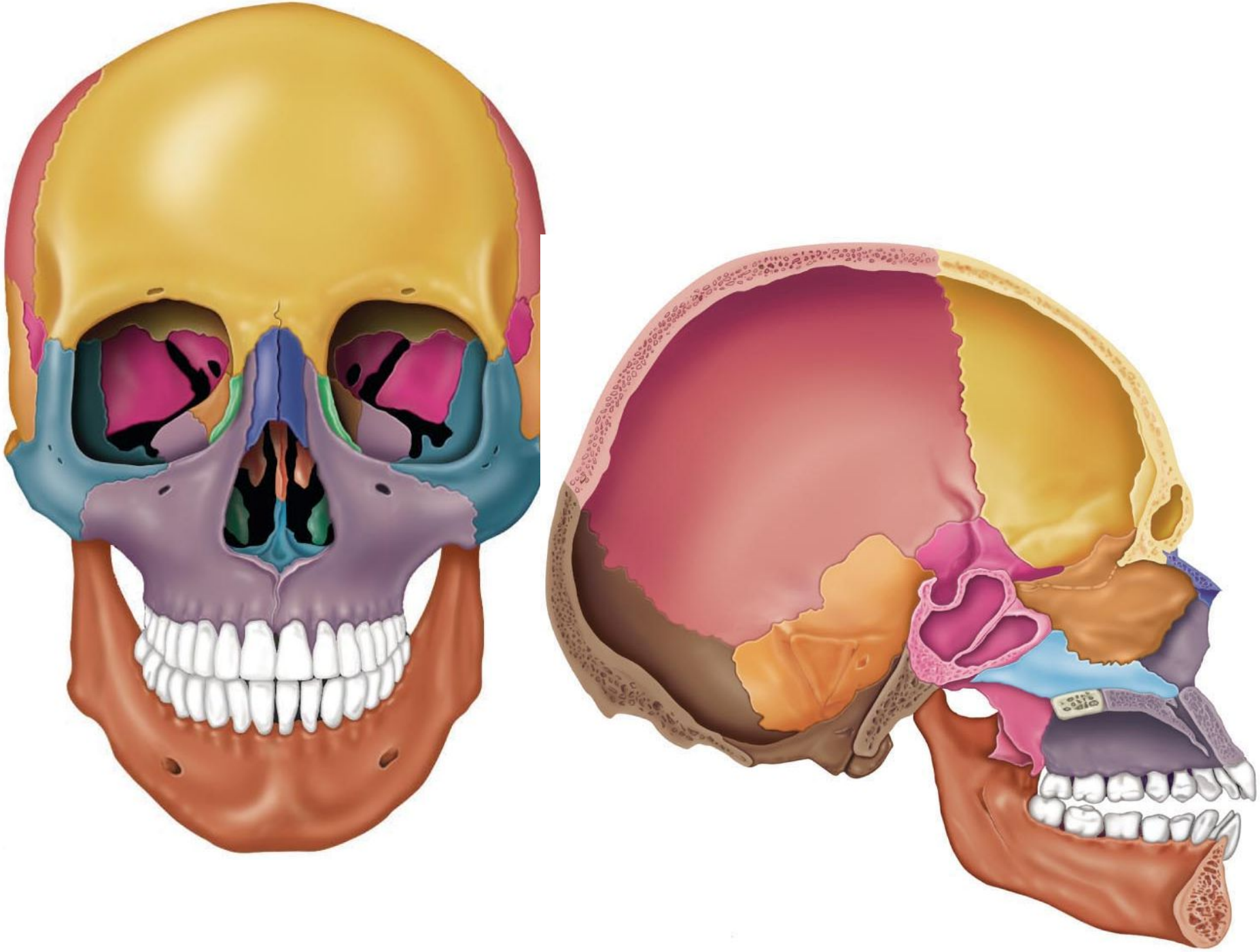

## ***(ii) Maxillary bones:***

- fused medially
- alveolar margins hold teeth of upper jaw
- palatine processes project posteriorly forming anterior 2/3 of hard palate

**note:** (incisive fossa) (passage of blood vessels & nerves), frontal processes & zygomatic processes

main portion of bone on each side has maxillary sinus - these are the sinuses that get infected





***(iii) Zygomatic bones:*** = cheekbones

- articulate with **zygomatic processes** of maxilla, frontal & temporal bones
- contribute to inferolateral margins of orbit

***(iv) Nasal bones:***

- 2 tiny, rectangular bones that fuse medially to form bridge of nose
- articulate with **frontal** bone superiorly & **maxillary** bones laterally

***(v) Lacrimal bones:***

- 2 fingernail-shaped bones in anterior, medial portion of orbit – lacrimal sacs reside here to collect tears

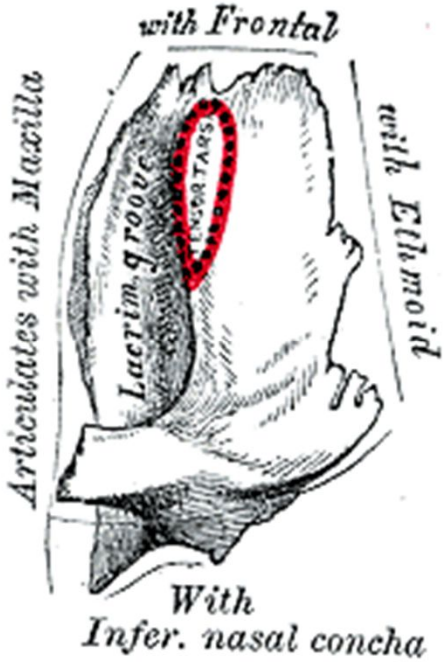
*articulate with:*

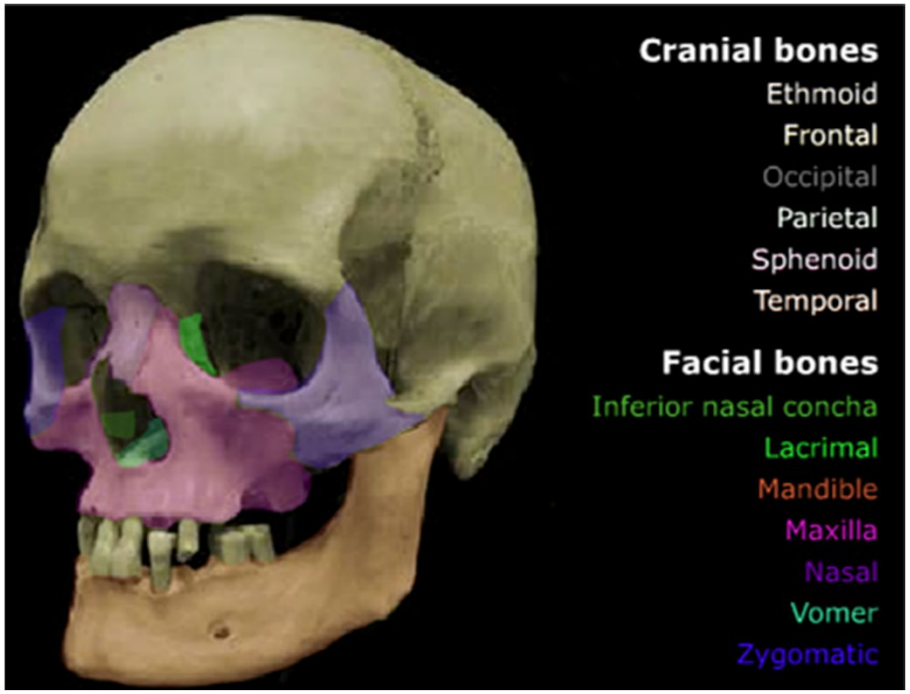
**frontal** bone

**ethmoid** bone

**maxillae**

each has a depression (**lacrimal fossa**) for *lacrimal sac*



**Orbits:**

zygomatic

frontal

maxilla

ethmoid

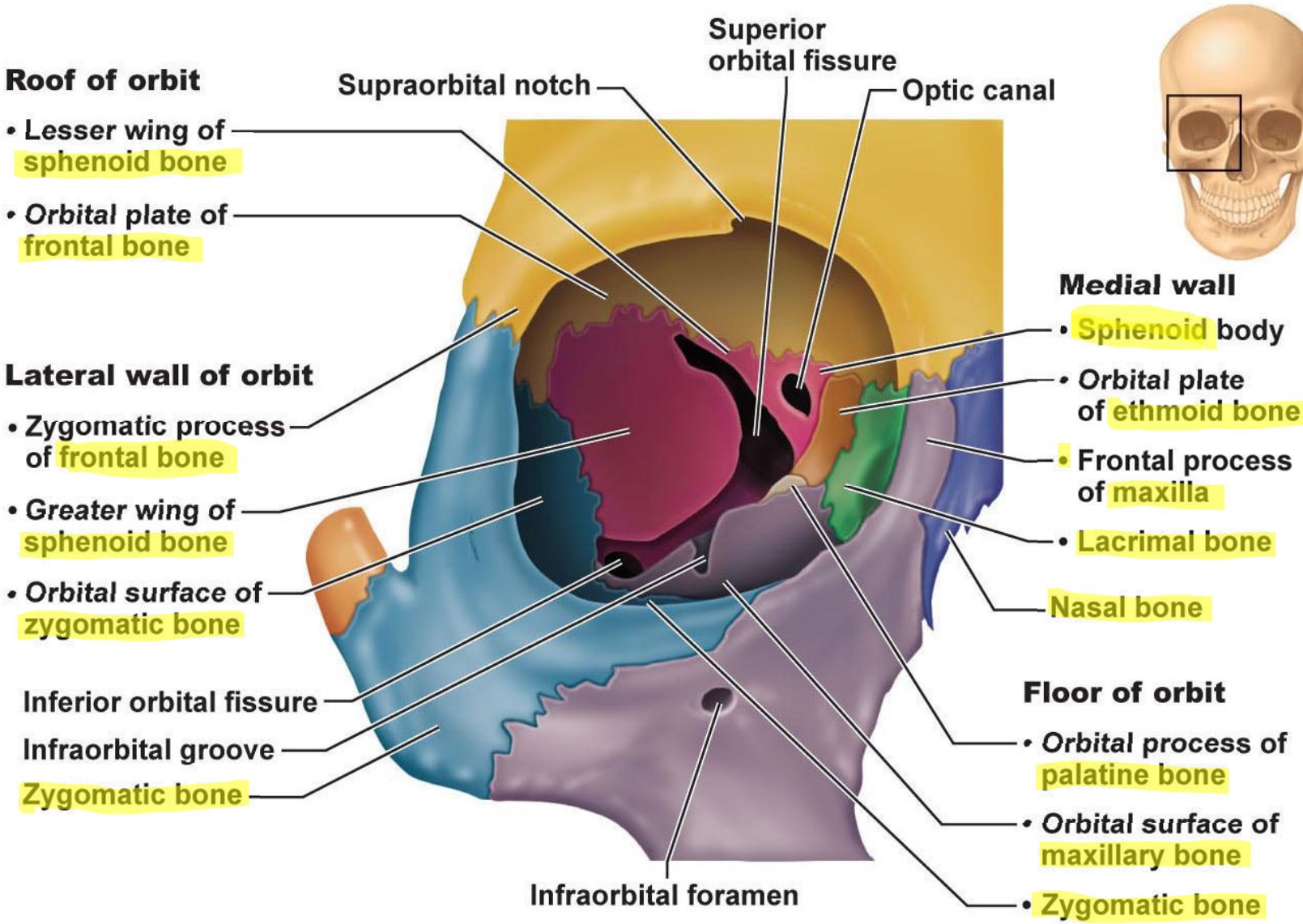
lacrimal

sphenoid

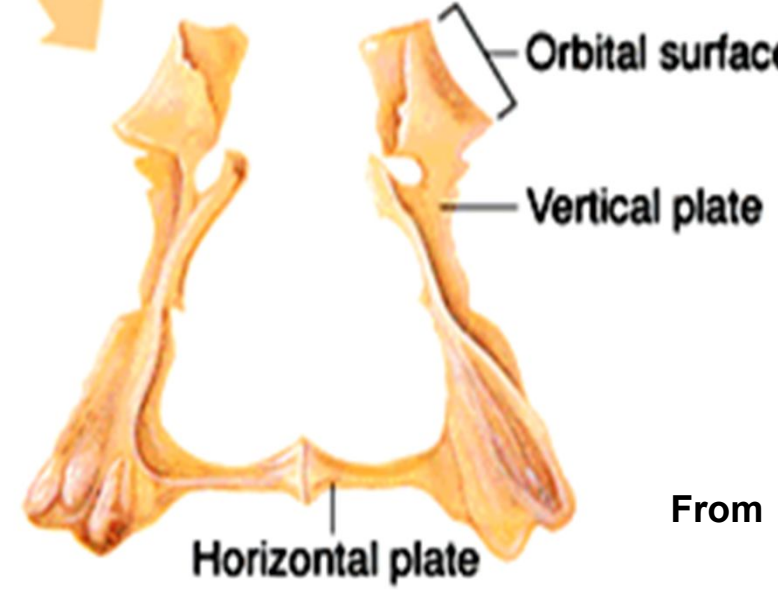
palatine

(orbital process)

Fig. 7.13




**(b) Contribution of each of the seven bones forming the right orbit**



(c) Palatine bones (posterior aspect)

From Fig. 7.8

## *(vi) Palatine bones:*

2 L-shaped bones, fuse medially
**horizontal** plates form part of **hard palate**
**vertical** plates - nasal cavity & orbit

## *(vii) Vomer:*

single thin bone forms nasal septum (blue in below diagram), right in the center, divides nasal cavity into 2
(see **Fig. 7.4a**)

Fig.7.6a

## *(viii) Inferior nasal conchae:*

[superior and middle nasal conchae from ethmoid bone]
thin, curved bones - project medially
largest of 3 pairs of conchae
just there to make nasal cavity rough so air circulates more

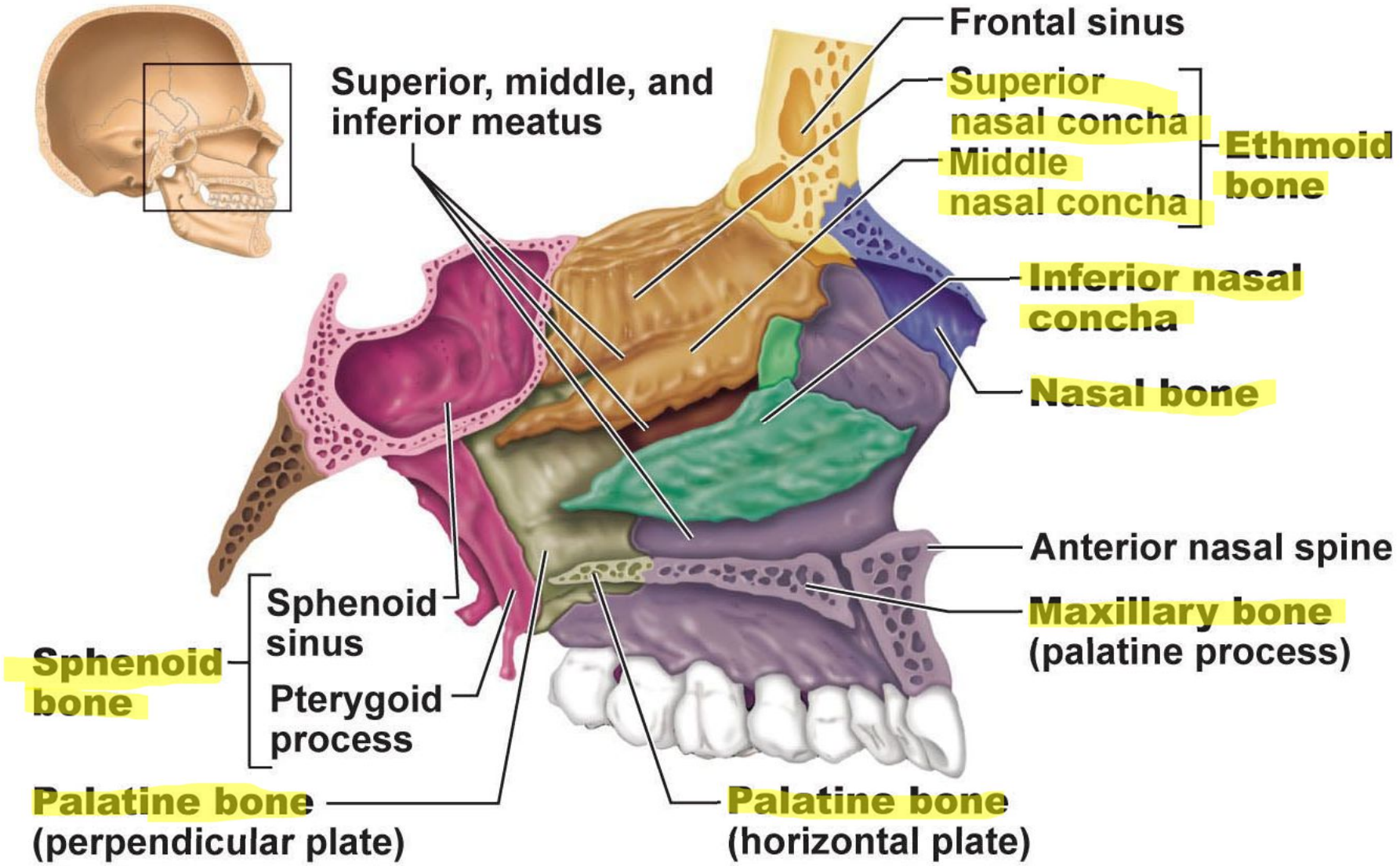



Fig. 7.14a: Bones forming the *left lateral* wall of the nasal cavity:

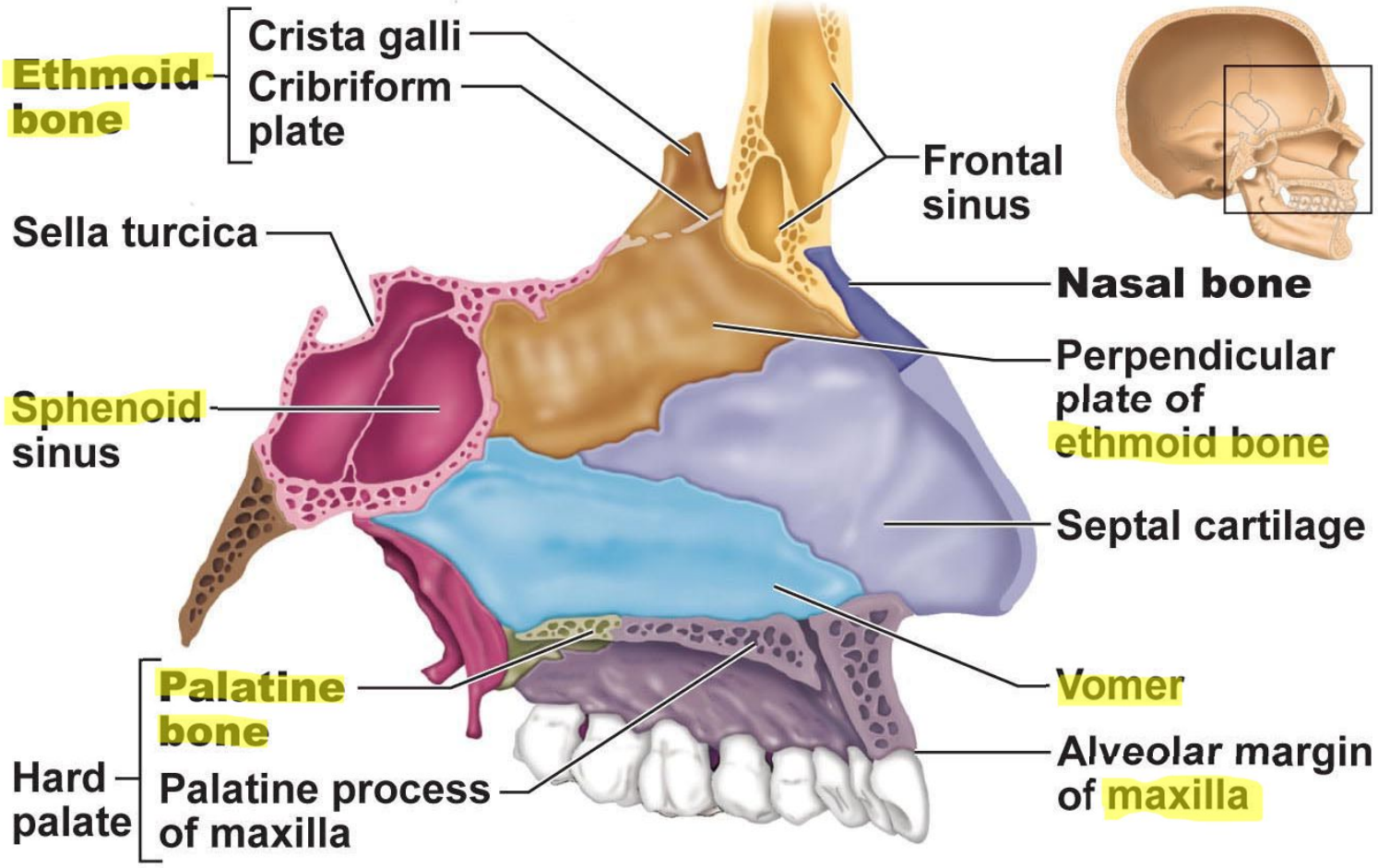
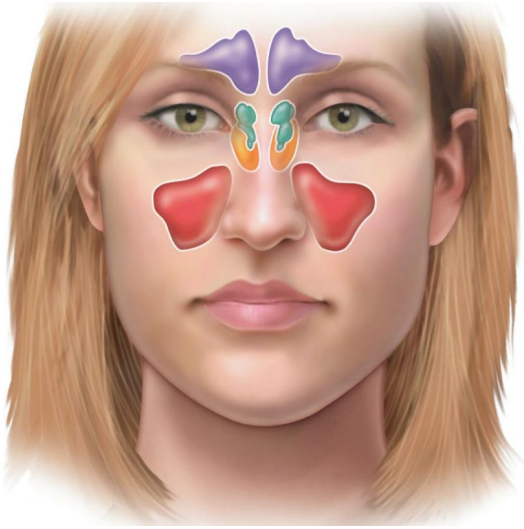



Fig. 7.14b: Contributions of ethmoid & vomer bones & cartilage to nasal septum:

Fig. 7.15



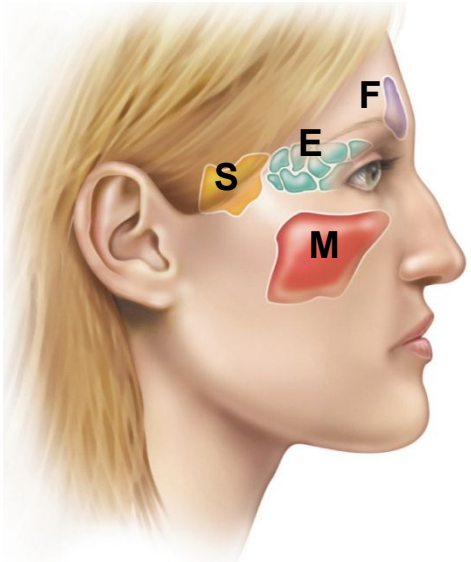
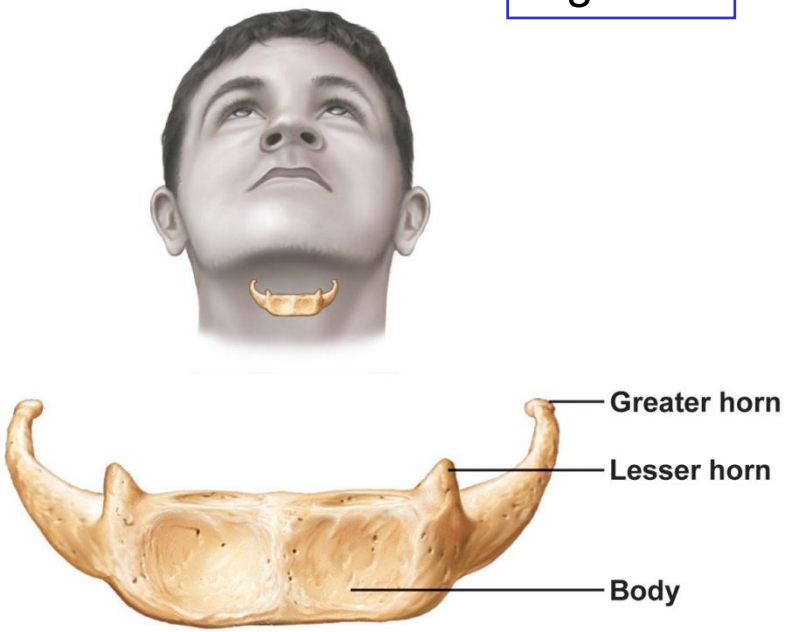



Fig. 7.12




## Paranasal Sinuses:

**frontal**

**maxillary**

**sphenoid**

**ethmoid**

mucosa-lined, air-filled

lighten skull and enhance resonance of voice; connect to nasal cavity so also help to warm & humidify incoming air

## *Hyoid:*

- only bone of the body that does not articulate with any other bone
- supports tongue & gives attachment to muscles for swallowing & speech
- horseshoe-shaped with a body + 2 pairs of horns